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Fig. 4 p. 322.



*Fig. 1.
p. 282*

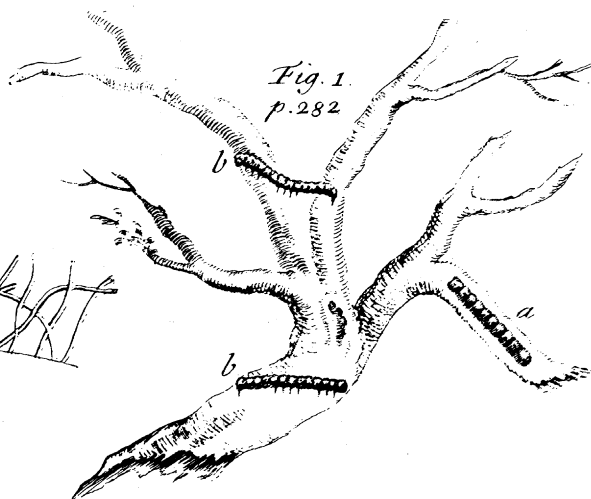


Fig. 3. p. 322.

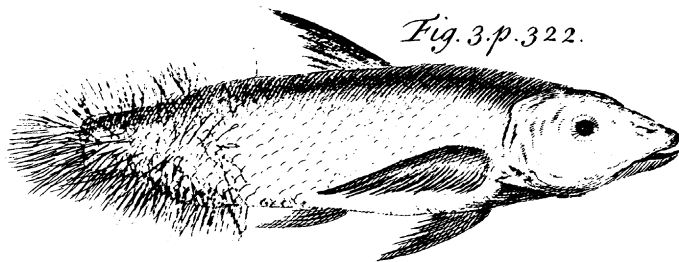
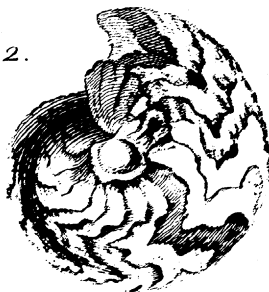


Fig. 2.

p. 320.



C



A



B

III. *A Letter from the Right Hon. John Earl of Orrery to Martin Folkes Esquire, Pr. R. S. inclosing an Account of the Cornel-Catterpillar, contained in a Letter from the Reverend Mr. Philip Skelton to His Lordship.*

S I R,

Read April 21. 1747. **T**HE great Honour which I have received from the *Royal Society*, makes me very ambitious of expressing my Sense of it, in some manner that may at least be a Mark of my Gratitude, however unworthy of their Attention. Inclosed in another Packet I send you a Letter I have received from the Reverend Mr. *Philip Skelton*, who, at my Request, has drawn up the Account of a sort of Caterpillars, that appeared very numerous in these Parts some Years ago. He has likewise pasted on the first Leaf a Piece of their Web*. He is my Neighbour here, and a Gentleman of Sense and Learning. The Letter is so full and explicit, that I need say nothing on the Subject: Unless hereafter you are desirous to know further Particulars; and I hope you are convinced, that I shall be always ready to obey your Commands. I am, Sir, with the greatest Esteem, and the utmost Respect,

*Caledon, April 6.
1748.*

Your most obliged and

obedient humble Servant,

ORRERY.

The

* To be seen in the *Musæum* of the *Royal Society*.

*The Rev. Mr. Skelton's Letter to the Earl of
Orrery.*

Monaghan, March 29, 1748.

MY LORD,

PURSUANT to my promise, I send you an account of the Cornel-Caterpillar, the web it produces, the flie into which it is changed, and a small sample of its work.

In the beginning of *May* 1737, the warmest season that any body now alive remembers to have felt, the Cornel-trees, of which we have a good number about this place, appeared almost cover'd with small Caterpillars of the size and shape in TAB. I. *Fig. 1.* and in general of a duskyish green, resembling in colour the bark of the tree, altho' a few, considerably larger than the rest, were yellow. These worms were employed partly in feeding on the leaves of the Cornel, which was their only Nourishment, and partly in crawling (with a very swift motion for a worm) over the bark of the tree. As they crawled, they left each a fine thread, scarcely visible to the naked eye, sticking to the bark. These threads, being almost infinitely multiplied by the inconceivable number of worms employed in the work, formed the web, in which the threads are not interwoven, but cohere by some roughness or glutinous quality.

By the end of *May* there was not a leaf to be seen on any of the Cornels, excepting a few, reserved for a very curious purpose, which I shall have
occasion

occasion to mention presently. But the worms, in the room of the green cloathing they robbed those trees of, gave them one of white, so entire, that it covered the whole bark, from the ground to the points of the slenderest twigs, and of so pure and glossy a colour, that the whole tree shewed in the sun as if it were cased in burnished silver. The web was so strong, that if one disengaged it from the tree, near the root, one might have stripped it from the trunk, the branches, and the twigs, at one pull. As soon as the worms had covered all the Cornel-trees, they removed from thence, and covered all the Ash, Beech, Lime, Crab-trees, and even weeds, that grew near them, with the same, but a thinner, kind of workmanship.

Perhaps, my Lord, you will desire to know how they travelled from one tree to another. Many of them crawled along the ground, and over every thing in the way, still leaving a thread behind, and dispatching a part of their business as they went to a more convenient surface to finish the rest on. But I really imagined some of them took an easier and more ingenious way. I found many of them hanging by their own threads from the most extended branches of the tree. While they were in this situation, a gentle puff of wind might, by exciting a pendulous motion, waft them to the next tree. This seems to be the method, by which those very minute spiders, whose threads are made visible by the moisture adhering to them in a foggy morning, transport themselves from one bush to another, altho' destitute of wings, sometimes across narrow paths, and even rivulets.

As

As the worms, neither while they were working it, nor afterwards, made any use of the web thus left on the bark of the trees, I take it for granted, they wrought for no other purpose than to rid themselves of that glutinous mass, out of which it was spun, and which, nature producing it that season in greater abundance than was necessary for the wrapping and stowing the worm in its *Nympha* state, prompted the creature to work off the redundancy the best way it could. The method it made use of for this purpose was very well judged. It fasten'd its thread to some little eminence on the bark; and chusing, for the greater convenience of crawling, that even surface, kept continually in a brisk motion, till the troublesome superfluity of its burthen was discharged. I can but guess at its reason for removing from its own native tree, to spin abroad upon the neighbouring ones. Perhaps it found the web too bright for its eyes, or the threads, already layed, might have stuck to its feet; for your Lordship may observe that the web is very apt to stick to the fingers, when it is touched.

About the beginning of *June* the worms retired to rest. Their manner of preparing for, and executing this, was very ingenious and curious. Some of them chose the under sides of the branches, just where they spring from the trunk, that they might be the better defended from the water, which in a shower, flowing down the bark of the tree, is parted by the branches, and sent off on each side.

Here they drew their threads across the angle, made by the trunk and branch, and crossing those again with other threads in a great variety of directions

rections, they afterwards formed a strong tegument on the outside. Within this they placed themselves lengthways among the threads, and rolling their bodies round, spun themselves into little hammocks of their own web, while in the mean time they shrunk into half their former length. Those hammocks, being suspended by the transverse threads, did not press each other in the least. That they might take up the less room, they lay parallel to one another, and in the most convenient order imaginable.

Others, still more ingenious than these, fastened their threads to the edges of certain leaves, which, no doubt of it, they had saved from their stomachs for this very purpose; and with that slender cordage pulling in the extremities of the leaves, drew them into a kind of purse, in the inside of which they formed the same kind of work, and laid themselves up in the same manner as above. By this method they saved themselves a labour, which the rest were at the expence of; for the leaf served them very well for an outward defence against the weather, and a place to fix their transverse threads to. It is probable they laid themselves up in great numbers together, not only because many were necessary to the work of providing a common covering, but also to keep one another warm, while nature was preparing for the great change, and also to confine some subtil vapour, issuing from their bodies, which might have been conducive to their reviviscence, and which had been easily dissipated, had they not lain close, and caught it from one another.

Between the worm, thus laid up, and the hamock, in which it was enclosed, a tough and pliant shell, of a dark-brown colour, was found. This I take to have been formed by the perspiration, or rather by some glutinous stuff, forced through the pores of the insect, while it was contracting itself, which being stopped by the close texture of the hamock, consolidated, and formed an interior covering for this delicate creature. As the worms themselves were of a pretty dark colour, this superficial tincture seems to have been in a great measure purged off into the shell.

For after the worms had continued in this state during the whole month of *June*, whether they gnawed their way through the ends of their shells and hamocks, or that exit was prepared for them by some corrosive matter ouzing from their mouths, I know not, but they came out almost all in the space of one morning, the most beautiful flie or moth that my eyes ever beheld. Its shape was extremely elegant; its head, upper wings, body, legs, and *antennæ*, were of the purest white, and glitter'd as if they were frosted with some shining kind of substance. I rubbed some of this off, and upon viewing it thro' an ordinary microscope, it appeared like the points of very minute feathers, or like small cones of polished silver. The upper wings were regularly studded with small, round, black spots, and extended themselves from its head somewhat beyond its tail. The under wings, which were a little shorter, were of a dusky colour, and prettily fringed at the extremities.

This

This beautiful and surprising work of nature seemed, after its resurrection, to have no dependence on material food. The Cornel had recovered a new set of leaves by the time the fly appeared; but it never touched them; and those that came out in my room, lived as long there, as the rest which enjoyed the open air, and the tree on which they were bred. If they did feed, it must have been on some other adventurer of the air, too minute to be visible to our eyes. Those that were confined to my room, discharged a small drop of brown liquor, in which I suppose their eggs were contained; but as they were not deposited in a proper receptacle, they did not produce worms the next year. As the tree is the peculiar habitation of the worm, and supplies it with its only food, so it is certainly the only nurse of its egg. It is likely the eggs were either inserted into the small crevices of the bark, or discharged into the little apertures, where buds are to spring the following season. In this situation, they might be most conveniently nourished by the return of that genial juice, or spirit, with which the Cornel is naturally fitted to cherish and raise them into life. The flies seemed to be of a most delicate constitution in respect to heat and cold. The former they could bear with difficulty; the latter, not at all. Hardly any of them survived the first of *August*. They loved rest, and did not care to flutter much about. While they were yet in their *Nympha* state, I brought great Lumps of them to my room, and those, which happened to be bruised in pulling them from the trees, produced flies, distorted either in the wings or other parts; but this

Distortion generally wore off, in a little time, and the pretty creature recover'd its own natural symmetry of shape.

In the beginning of *May* 1738, they began to work again in prodigious numbers, and having covered some trees, were stopped, and most of them destroy'd by the foul weather that followed. Their web also was smutted and discolour'd. I send your Lordship a piece of each year's produce. The whitest is that of 1737, the other of 1738.

In 1739 they appeared in small numbers, and much shrunk in their Size, and wrought only sufficient covering for themselves.

They appeared again in the Year 1740; but it was plain the great frost had destroyed most of their eggs, and checked the growth of those that escaped; for there were very few of them to be seen, and twelve of them were not larger than one in *May* 1737.

Every year produces more or less of them, with some small variation, as to the number and size.

The place where our Cornel-trees stand, is surrounded with steep hills, and closely shelter'd with a very thick plantation. This was probably no inconsiderable help to the prodigious encrease of this puny reptile. I verily believe both an unusual warmth of air, and a deep shade, were equally necessary to it; for I observed, that those Cornels, which stood more exposed to the cool air and the sun, abounded less with worms than the rest.

I have been scrupulously exact, my Lord, in relating the above particulars, which I did not trust

to

to my memory, but reduced to writing immediately after I had finished my observations.

This curious *phenomenon* naturally leads one to enquire, how these creatures came to breed on the Cornel-trees, and what occasioned the prodigious encrease of them at that time. Here fact gives us up to conjectures. I hope however that mine will not seem to your Lordship altogether unsatisfactory, but rather help to clear up those difficulties, and at the same time carry our eyes a little farther into nature, than merely to what concerns this species of insects.

There is not an animal, nor a vegetable, that may not be considered as a little world, in respect to the habitation and nourishment it affords to certain insects peculiar to itself. The scheme of life begins in vegetation; and wherever on the earth, or in the water, nature is able to produce vegetables, she always obliges them to pay for their elemental nourishment to certain insects, animals, or fishes, which she billets on them. These again are forced to refund to others, to diet and lodge, each of them, a set of living creatures, assigned to them by the universal scheme of nature.

This traffique of life, this just community in nature, which suffers nothing to subsist merely for itself, is found not only every-where on the face of the earth, but also in all lakes, pools, rivers, and in the ocean. By microscopes we discover a prodigious variety of little creatures, all feeding either on the floating vegetables, which that element produces in a state of stagnation, or on one another. As to the sea in particular, we know only what
happens

happens about the shores, where we see vegetables of various kinds, on which a like variety of insects are bred and nourished. These, together with a prodigious number of others, bred in the mud, become the prey of the smaller kind of fishes, and they again of the greater. That this scheme of nature, in supporting life by death, found every-where else, dives into the depths of the ocean, may appear probable from the wise frugality of nature, which hath an useful end in every thing, and besides rejoices in filling the world with life and motion; and also from the wonderful kinds of fishes, which are now-and-then washed up by violent storms from the deep waters, or happen to pursue their prey, from the low lands of the ocean, to the higher grounds at the shores.

Franciscus Redi, in his curious treatise concerning the generation of insects, hath not only refuted the notion of equivocal generation, but also hath shewn us, that each animal and vegetable hath its own peculiar insects to maintain; and *Eleazar Albin*, in his collection of various caterpillars, and the butterflies, into which they are transformed, hath given us a beautiful demonstration, from above an hundred instances, that each species hath its own proper plant, to which it is by nature peculiarly adapted, and on which only it can feed, or live for any considerable time.

Now the Cornel, my Lord, is the plant, on which alone the worms, we have been speaking of, can be propagated and fed. The specific qualities, with which the juices of this tree are impregnated, fit it
for

for the propagation and support of this its native insect. If these peculiar and distinguishing qualities reside, as the chymists say, in the essential oil of the plant, it will follow, that this, as well as other insects, subsisting on vegetables, are by some means or other qualified to extract, in a nicer manner than any chymist can do, the essential oil of their respective plants, nothing else therein being of a nature sufficiently peculiar either to assist the propagation, or supply the nourishment, of the insect.

As to the difficulty, how this plant came to receive the eggs of this flie, it is as great in respect to the propagation of any other insect on its peculiar plant. The flies of every plant have continual access to those plants, and no doubt are prompted by the sight, smell, or other qualities of their native vegetable, which are congenial to them, to propagate their kind upon them. As this act is probably attended with some degree of pleasure, it keeps them continually busy in the work of impregnating their proper plant. Hence it comes, that before the younger plants are removed to a distance from those that are more fully grown, they receive sufficient colonies from others, already peopled, which they extend again to their succours, the flies each year impregnating all the plants within their reach. Whether the thing happens in this manner, or that the eggs of insects so small are minute enough to be carried through the air, and so dispersed everywhere, it is nevertheless a fact, that no vegetable is found without its insects, tho' propagated by the seed.

As

As to the extraordinary increase of this insect in *May* 1737, the succession of seven or eight mild winters, which preceded that season, might, by preserving their eggs, give occasion thereto. As they are one of the earliest kinds, the excessively warm *May* that year so effectually hatched their eggs, that they all came to perfection: Whereas the more ordinary worms and flies, that make a later appearance, meeting with the sharp easterly winds that happened that summer to blow during the months of *July* and *August*, were in a good measure destroyed; otherwise it is possible they too might have had an extraordinary increase.

However I own, my Lord, this reason hath its objections, and doth not fully satisfy me. There is scarcely a year that is not remarkable for some one kind of insects or flies, when no colourable reason can be assigned for it from any known temperament of the year, which might not as well favour a great increase of any other species. Insects, as well as fevers, are epidemical, and probably depend as much on a certain occult constitution of the air, water, or earth. Nay, it is an opinion received by some, that all pestilential disorders are nothing else than prodigious flights of invisible flies, of which each sort, according as the constitution of the year assists it, takes its turn to multiply from worms proportionably little, bred in putrid carcases, especially after great battles, and being raised from thence into the air, are wafted not only from one body to another, but even to distant countries. *Sydenham*, and, if I mistake not, others, have observed, that the seasons immediately preceding those
in

in which the plague raged, abounded unusually with all sorts of flies; which shews at least, that the constitution of the air doth at those times greatly favour the production of such creatures. This conjecture will seem the more probable, as the usual preservatives against infection, namely vinegar, tobacco, rue, wormwood, &c. are endued with very acrid and pungent particles, with which perhaps they sting and kill the invisible flies before they can lay their eggs, and by these means preserve us from contagion.

Be this however as it will, it is certain there is such a constitution as we are here speaking of, in respect both to distempers and insects. But whence this proceeds, whether from the sun alone, or from the joint influence of other neighbouring planets, or the transudations of mineral vapours, or fermentations in the soil of the earth; and further, whether this sort of climacteric in the seasons be stationary or casual; I leave better naturalists to judge.

I only insist, that such a constitutional temperament there is, which, running thro' all nature, doth at certain times give more than ordinary energy to the prolific powers of such plants or animals as are of nature similar thereunto.

This plainly appears to us in plants of all kinds, even excluding the consideration of warmer or colder, of drier or moister seasons, which, it is manifest, have only their share in the casualties to which the vegetable world is liable. They frequently bear more blossoms and fruit in a bad, and less in a good season; and what puts the matter beyond all question, that season which is favourable to one

kind of vegetable is prejudicial to another; whereas much heat and moisture together are equally indulgent to all. This, in my opinion, shews that each plant hath a specific vegetation of its own, as well as one common to all, and that the former depends upon somewhat else than mere warmth and moisture.

The constitution therefore of the year disposes the vegetative spirit, whether residing in the air, the earth, the water, or in all, to supply sometimes these, and sometimes those vegetables, with a greater or less proportion of aliment. By these means a greater quantity of that juice, which distinguishes any one species of plants from all others, and enables it to give life and food to its peculiar inhabitant, must necessarily be produced one year, than another; and consequently the eggs, deposited in the cavities, or perhaps in the very perspiratory pores of its bark, must be better cherished, and the worm more plentifully fed by the leaves, which in such a year contain a greater abundance of the specific juice, and that more perfectly elaborated.

From hence it may seem reasonable to rest in this conjecture, till somewhat more certain is found out, that the annual constitution being more indulgent to the vegetation of one plant than of another, promotes the growth and fertility of this, which is of a similar, and checks the increase of that which is of a dissimilar nature. The plants, thus differently supplied, furnish their respective insects accordingly. Hence again it comes to pass, that many species of insects, having been injured by some unknown disposition of the air or earth, seem

seem almost extinct in one season, and swarm out again in another, as if there had been a new creation of them. One year, the wall-fruits are devoured by earwigs; another, we are pester'd everywhere, and even in our closest chambers, with unusual multitudes of the common fly. One year the wasp predominates; another, the gnat; and a third, the cale-caterpillar. One year, the farmer complains of a worm, hardly known to him before, that destroys his corn; and the gardener does the same another, in respect to an insect that falls greedily on his seeds, as soon as they are committed to the ground. The *African* locusts come some years into *Spain* in such swarms, that they cover the face of the earth; and when they have devoured the whole herbage of the country, retire again to their own, and do not visit *Spain* in the like numbers for several years. Large old orchards are some years suddenly stripped of all their blossoms and leaves, by a prodigious increase of the apple-tree-worm; and groves of oak have been served in the same manner by the caterpillar peculiar to that tree. This must needs give a check to the growth of the tree more than equivalent to the great increase promised at such a time by the extraordinary redundancy of the vegetative spirit.

I have now finished what I had to say on this surprising subject, at which some gentlemen stupidly important, may laugh, as at an affair not worthy of so much notice, and so many words; but I am persuaded, my Lord *Orrery*, who regards not things by their bulk, but their excellence, will see the wisdom and power of God as gloriously displayed in

this little insect, as in the Behemoth, or the Leviathan. It is a flight high enough for the faculties of man to rise by contemplation to a competent knowledge of the meanest work God ever condescended to form. That which was not beneath the Majesty of God to make, can never surely be beneath the dignity of a rational creature to contemplate. I am,

My LORD,
*Your Lordship's most obliged, and
 most obedient humble Servant,*

Philip Skelton.

IV. *The Extract of a Letter from Dr. James Mounsey, Physician of the Czarina's Army, to Henry Baker F. R. S. concerning the Everlasting Fire in Persia.*

S I R,

*Read April 27.
 1748.*

AS you inform me any thing relating to the Natural History of *Persia* will prove agreeable, I have some time ago wrote to a couple of Gentlemen, a Physician and a Surgeon, both Men of Learning and Veracity, and my very intimate Friends, who are now with the Ambassador from this Court to *Persia*, and they both have promised to communicate to me whatever they shall meet with remarkable in that Country
 and